SPECIAL PUBLICATION 44

POTENTIAL DISPOSAL SITES FOR CLASS 1 WASTE IN SOUTHERN CALIFORNIA

SEPTEMBER 1973

Prepared by
THE CALIFORNIA DIVISION OF MINES AND GEOLOGY

POTENTIAL DISPOSAL SITES FOR CLASS I WASTE IN SOUTHERN CALIFORNIA

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This report was prepared by the Division of Mines and Geology of the State of California, Department of Conservation for the State Water Resources Control Board to meet the requirements of Task Order A(DMG) of the Comprehensive Water Quality Control Plans.

September 1973

Introduction

This study was conducted as a cooperative project between the California Division of Mines and Geology, which was responsible for reconnaissance geologic work; Bechtel Incorporated, which was responsible for engineering and economic support; the Santa Ana Watershed Planning Agency, which provided overall planning coordination; and the California Water Resources Control Board, which provided financial support for the project. This report was produced solely by California Division of Mines and Geology with advice and coordination from the other cooperating organizations.

The purpose of the project was to inventory existing Class 1 waste disposal sites in the Los Angeles - San Diego area, and locate potential new disposal sites for chemical and toxic wastes (Class 1 sites). The anticipated waste volume is 200,000 to 400,000 gallons per day, or crudely, one acre foot (325,851 gallons) per day (figures provided by the Santa Ana Watershed Planning Agency.) The area searched is within 200 miles of Santa Ana in Orange County. The area of greatest interest is the Mojave Desert because: 1) intensive urbanization southeast of the San Bernardino Mountains was considered to rule out any possible sites in that sector, and 2) the California Department of Water Resources is conducting a similar study within the Los Angeles and Santa Ana River basins.

The principal field investigations of the proposed sites were conducted by John L. Burnett. Most of the data on existing sites were gathered by Gary C. Taylor. The authors appreciate the advice of Yvor Smitter, Geologist, Division of Mines and Geology, during the study.

Conclusion and Recommendations

1. Underground and open pit mines are not desirable for waste disposal, principally because such use would contaminate potentially usable mineral resources.

2. Dry lakes are considered to be the best type of site for future Class 1 waste disposal. Galway and Melville dry lakes offer the best potential as future sites, mainly because they require least haulage cost.

3. At an early stage in any subsequent investigation, drilling should be conducted to obtain current information on: depth to bedrock; depth to groundwater; groundwater quality; and permeability.

4. Low density urbanization is now taking place in many parts of the Mojave Desert. Action on a class 1 site should be conducted quickly before additional conflicts develop over use of the land.

EXISTING CLASS 1 DISPOSAL SITES IN SOUTHERN CALIFORNIA

At the present time (September 1973), seven Class 1 sites are operating in Southern California. The requirements for a Class 1 site are summarized below:*

> There must be no possibility of discharge of pollutant substances to usable waters. Artificial barriers may be used for control of lateral waste movement only. Usable groundwater may underlie the site, but only under extreme cases and where natural geological conditions prevent movement of the wastes to the water and provide protection for the active life of the site. Inundation and washout must not occur. All waste groups may be received.

Information on the existing operations is summarized on Table 1. Although an estimated life is given, this may be extended if operators are successful in current attempts to obtain additional land or shortened if the rate of dumping or other constraints should increase.

The Stringfellow Quarry Disposal Site on Armstrong Road, north of Rubidoux, Riverside County, has not been included because it is presently closed.

Palos Verdes

The site accepts no flammable liquids, malodorous substances or substances with a pH lower than 4 or higher than 12. Most of the liquids accepted are oil based or bottom tank sediments. Exotic chemicals that are not accepted are referred to the West Covina site.

West Covina

The site uses a cut and fill method of disposal. The ability to accept liquids is based on the amount of rubbish accepted; rubbish is used to absorb the liquids. In some cases special pits are dug for concentrated, hazardous materials. The site accepts all types of liquid wastes except those that are radioactive.

Otay

The liquids accepted consist almost wholly of oily wastes, which are dumped into holding ponds and allowed to evaporate. Cyanide and radioactive wastes are not accepted.

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*State Water Resources Control Board, November 1972, Waste Discharge Requirements for Waste Disposal to Land -- Disposal Site Design and Operational Information, 61 pages.

O'mar

The liquids accepted consist of chemical wastes including acid, caustic, and cyanide. Liquids are mixed and reduced in volume through evaporation.

Mission Canyon

This site has applied for, but not yet received, approval for Class 1 status. If approved, the operators will build retaining walls to confine liquids. The operators are considering the possibility of a treatment plant which will include oil fraction recovery and neutralizing of acids and caustic.

Calabasas

No limits are set on solid waste, but liquid wastes are controlled by the quantity of rubbish available to absorb them. The site does not accept flammable liquids, petroleum sludge, or septic tank sludge.

Simi Valley

Solids and liquids are handled separately, so the quantity of liquid is not limited. Dangerous liquids are buried and the producer is charged an hourly rate for the work required. These liquids are disposed of in a restricted area and records are kept of the location and quantity.

POSSIBLE FUTURE SITES IN SOUTHERN CALIFORNIA

The objective of the project is to study deep mines, open pit mines, and dry lakes in Southern California. The primary area of interest is that south of the Garlock fault and within 100 to 200 miles from Santa Ana. This area roughly consists of the Mojave Desert between Victorville and Baker. Several open pit mines were considered which lie outside of this area.

Underground Mines

Early in this study, large underground mines were considered to be potentially suitable, but they have characteristics which make them undesirable. Most underground mines are not large enough to accommodate

the volumes of waste material being contemplated. These mines also have the undesirable trait of permitting no evaporation so that the only method of reducing the volume of waste is through leakage, which may reach surrounding groundwater supplies. Finally, even inactive mines contain some mineral resource that may become economically recoverable and needed at some future time. Recovery could not be done if the mine were contaminated with poisons. For these reasons, no additional consideration was given to underground mines.

Open Pit Mines

The suitability of large surface mines and quarries was also considered, because they could accommodate great quantities of waste material and they would allow normal evaporation to take place. A disadvantage common to all open pits is that the wastes would contaminate any potentially usable mineral resource remaining. Further, contamination of groundwater is a threat at many open pit sites. Two major open pits were considered, the Vulcan Iron Mine in San Bernardino County and the Alberhill Clay Pits in Riverside County. These sites were selected for consideration because they are among the largest open pits in the region and they typify conditions common to open pit mines. Both are owned privately by mining companies; their availability for waste disposal was not determined.

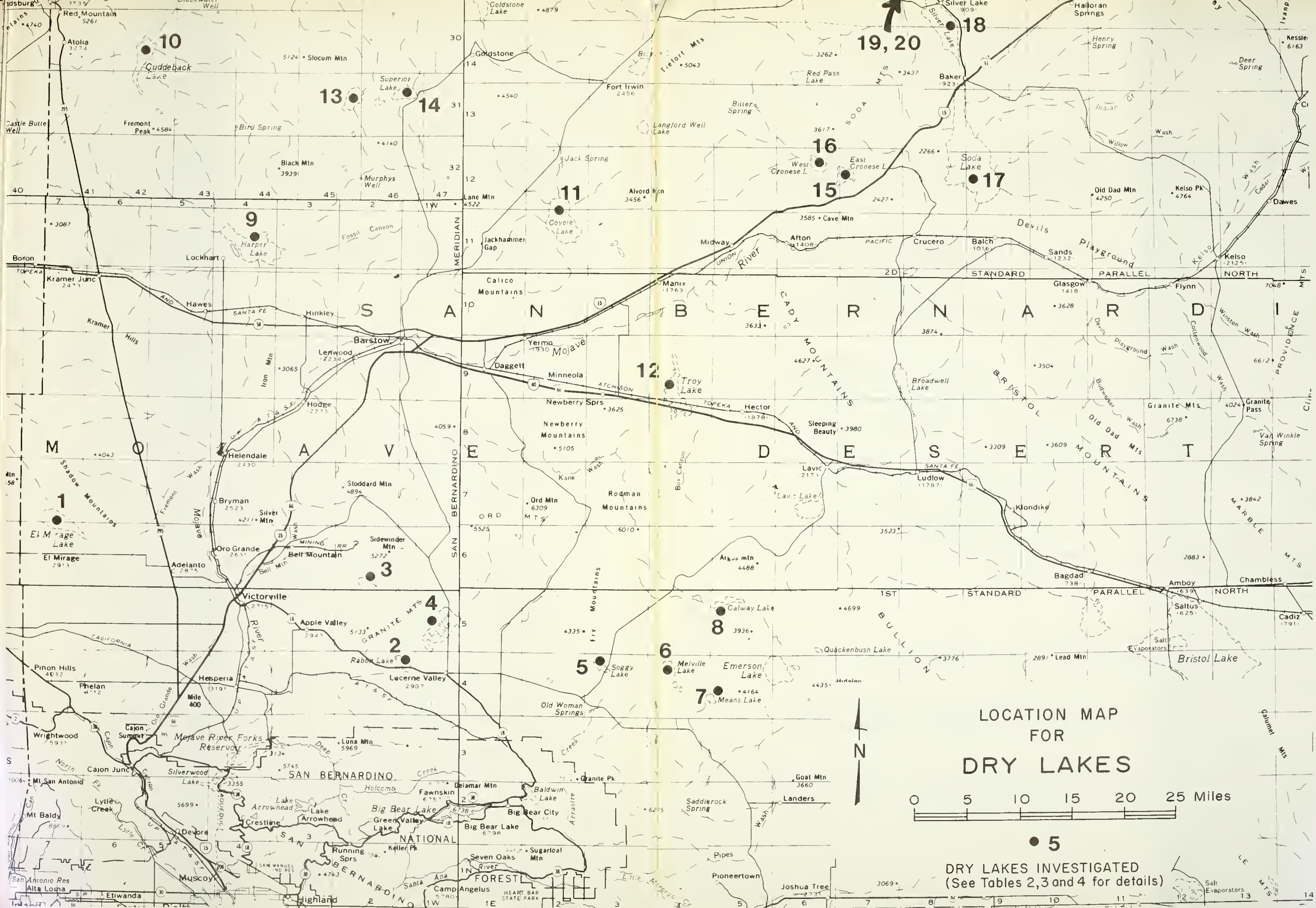
Vulcan Mine

Located 8.5 miles southeast of Kelso and approximately 265 miles from Santa Ana, this mine is owned by the Kaiser Steel Corporation, Fontana, California. It was developed largely because it was close to existing railroad transportation. The mine yielded 2,643,000 tons of ore from 1942 to 1948, leaving a pit about 800 feet long by 250 feet wide and 150 feet deep. Depletion of easily mined reserves and the high sulfur content in deeper ores were contributory reasons for its closing. The corporation then transferred operations to the Eagle Mountain Mine in Riverside County.

The Vulcan pit is considered unsuitable for a waste disposal site because of the great haulage distance, the limited volume of the pit, and difficulty of sealing the pit against leakage of toxic fluids into adjacent aquifers.

Alberhill Clay Pits

This source of high quality clays is located 31 miles from Santa Ana and is owned by Pacific Clay Products. The deposits have been developed by more than 80 pits located in sections 21, 22, 23 and 26, T 5 S, R 5 W, S.B.B.&M.


LOCATION MAP
FOR
DRY LAKES
0 5 10 15 20 25 Miles
N
5
DRY LAKES INVESTIGATED
(See Tables 2,3 and 4 for details)
SAN BERNARDINO
MOJAVE DESERT
El Mirage Lake
Rabbit Lake
Lucerne Valley
Cuddeback Lake
Superior Lake
Harper Lake
Coyote Lake
Troy Lake
Soggy Lake
Melville Lake
Emerson Lake
Means Lake
Galway Lake
West Cronese L
East Cronese L
Soda Lake
Silver Lake
Bristol Lake
Lavic Lake
Broadwell Lake
Quackenbush Lake
Victorville
Barstow
Apple Valley
Hesperia
Baker
Amboy
Ludlow
Daggett
Yermo
Hinkley
Helendale
Adelanto
Kramer Junc
Boron
Big Bear Lake
Joshua Tree
Landers
Devils Playground
Calico Mountains
Newberry Mountains
Rodman Mountains
Ord Mts
Cady Mountains
Bristol Mountains
Granite Mts
Bullion
Marble Mts
Providence Mts
Mojave River
SAN BERNARDINO MERIDIAN
1ST STANDARD PARALLEL NORTH
2D STANDARD PARALLEL NORTH
SAN BERNARDINO NATIONAL FOREST

These clay pits are presently supporting a sizable clay products industry, and it is doubtful that the various owners would be willing to commit them permanently to waste disposal. On the other hand, the clay bottoms and sides of these pits would tend to form impermeable boundaries and retain liquid wastes so that evaporation could take place.

On the basis of haul distance and geological suitability, the Alberhill pits would be highly suitable for Class 1 waste disposal sites. The availability of the land and suitability of individual pits must, however, be determined.

Dry Lakes

The ancient lake basins scattered across the Mojave Desert are a last and most promising possibility for a waste disposal site. Although they do have the disadvantage of being distant from the centers of production, their isolation and geologic characteristics overshadow that factor.

All of the dry lakes were formed in the same way. The basins are topographically closed and were formed by tectonic or mountain-building forces. During wetter periods in the past, they were filled with water forming chains of freshwater lakes. As the climate became drier into the present day, the lakes dried up, forming playas as the last remnants of the water evaporated. The dry lakes are now being slowly filled with sediment by occasional flash floods resulting from rain storms in the surrounding drainage basin.

All of the dry lakes are physically similar. They occupy bedrock basins that are partially filled with sediment. The upper parts are underlain by coarse sediments, sand and gravel, that are quite permeable. The central playa is underlain by impermeable clays. The occasional flash floods erode the upper parts of the playa, and the sediment-laden water accumulates and stands in the center of the playa where the suspended sediments settle out.

Groundwater underlies all of the basins, but its quality is marginal to inferior due to high quantities of dissolved solids and deleterious ions, such as sodium, chloride, boron and fluorine. Some of the larger lakes may have a potential for producing commercial quantities of saline minerals.

In considering the potential use of these dry lakes for Class 1 disposal sites, many factors were considered:

1. Present land use. Any other present use of the land is considered to be a conflict.

2. Physical size of the basin. Large playas were eliminated because more land would be contaminated than is needed for this purpose. Small playas were eliminated if they were considered to be too small for this use. An ideal size is thought to be 1 or 2 square miles of playa area.

3. Ownership. Basins on military land were not considered. The areas considered are in private ownership or are administered by the U.S. Bureau of Land Management. The policy of that organization toward land use is unknown.

4. Transportation access. The haul distance to the center of waste production in Santa Ana was considered as well as the need for additional roads or railroad spurs.

A disposal site design on a dry lake should utilize the central part of the playa for evaporation ponds. This is the most impermeable part of the dry lake and the area where no erosive downcutting takes place. The only natural hazard that occurs is the accumulation of standing flood waters to a maximum depth of one or two feet during infrequent storms. Dikes to confine the ponds should be constructed approximately 6 to 8 feet high from the dry lake clays which would isolate the waste from flood waters. Elevated roadways would have to be constructed of crushed rock so that trucks could gain access to the site during the wet weather.

As described, the site could accept all types of liquid wastes. Garbage and other solid waste could be accepted by establishing a cut-and-cover operation in another part of the playa, utilizing trenches.

Depth to groundwater should also be determined before any final decision is made on the choice of a site.

Suitability of Various Dry Lakes

Of 20 dry lakes considered, four were eliminated from consideration because thay are presently used for other incompatible purposes; these were Mirage, Rabbit, Reed, and Lucerne.

Another five lakes were eliminated because the haul distance was thought to be too great; these were East Cronese, West Cronese, Riggs, Silurian, and Silver. Soda Lake was eliminated partly because of its long haul distance, but also because it is larger than is needed for this purpose.

Of the remaining lakes, which are all worthy of consideration, Galway and Melville are thought to be especially desirable. They are of the size desired and both have an adequate freeboard so that spilling into

another drainage system is not likely. Galway is slightly more desirable because it has a smaller drainage basin surrounding it. The remaining lakes--Soggy, Means, Harper, Cuddeback, Coyote, Troy, West of Superior, and Superior--are considered to be equally desirable and are placed into a priority system based on the distance from Santa Ana. The overall priority listing, therefore, is as follows:

Galway--highest priority
Melville
Soggy
Means
Harper
Cuddeback
Coyote
Troy
West of Superior
Superior--lowest priority

EXPLANATION OF TABLES 2,3, and 4.
(For location of dry lakes, see center-spread map.)

Geographical factors: (Table 2)

Column 1. - Name of the U.S. Geological Survey quadrangle on which the dry lake appears.

Column 2. - Area of the drainage basin that flows into the dry lake.

Column 3. - Surface area of the dry lake playa.

Column 4. - Elevation of the dry lake playa in feet above sea level.

Column 5. - Number of vertical feet that the playa can be filled before it spills into the next drainage basin.

Column 6. - The direction and ultimate destination if the dry lake were to overflo

Column 7. - History of flooding.

Geological factors (Table 3)

Column 8. - Kind of material exposed on the surface of the playa.

Column 9. - Quality classifcation of the groundwater for human consumption. (Dept. of Water Resources Bull. 106-1).

Column 10. - Chemicals in the groundwater considered undesirable for human use of water. (Dept. of Water Resources Bull. 106-1).

Column 11. - Total dissolved solids in groundwater, measured in parts per million. (Dept. of Water Resources Bull. 106-1).

Column 12. - Average depth of groundwater below the playa surface (Dept. of Water Resources Bull. 106-1).

Column 13. - Present uses of the groundwater.

Column 14. - Evaluation of potential for producing commercial quantities of salts or brine.

Land use and engineering factors (Table 4)

Column 15. - Mileage to Santa Ana, the assumed geographic center of waste producti

Column 16. - Miles of road needed from existing two-lane paved roads to the dispos location.

Column 17. - Miles from nearest railroad, air distance.

Column 18. - Present land use. Visibility refers to possibility of viewing the sit from presently developed areas.

Column 19. - Estimated ownership by area. Federal land managed by the U.S. Bureau Land Management.

Table 1. Inventory of existing Class 1 waste disposal sites in southern California.

Name	Owner	Location (Address)	Location of site by land grid	U.S.G.S. quadrangle	Types of waste accepted	Average charges for disposal ($ per ton)	Total capacity (acres)	Remaining capacity	Current quantity of waste accepted (in tons or gallons per day)
Palos Verdes	L.A. County Sanitation District	26301 Crenshaw Boulevard, Rolling Hills	T5S, R14W. Not Sectioned.	Torrance and Redondo Beach	All types. Quantity of liquid accepted is limited to 80 trucks per day.	$2.00	80	1 year. life	4500 tons/day of rubbish. 615 tons/day of liquid.
West Covina	B.K.K. Corporation	2201 South Azusa Avenue, West Covina	T2S and T1S, R10W. Not Sectioned.	Baldwin Park	All types. Quantity of odor-producing materials is limited.	$2.00	600	590 acres	1800 tons/day of rubbish. 710 tons/day of liquid.
Otay	San Diego County Refuse Disposal Division	Otay Valley Road, Chula Vista	T185, R1W. Sec. 18 and 19.	Imperial Beach	All types.		265	200 acres	600 tons/day of rubbish. 3000 gals/day of liquids.
O'mar	O'mar Rendering	4826 Otay Valley Road, Chula Vista	No Land Grid.	Imperial Beach	Only liquids but no oily wastes.	$6.00	5	3 acres	20,000 gals/day of liquid.
Mission Canyon	L.A. County Sanitation District	2201 North Sepulveda Blvd., Los Angeles	T15, R15W. Not Sectioned.	Beverly Hills	All types.		500	5 years. life	4308 tons/day (No liquids).
Calabasas	L.A. County Sanitation District	26919 Ventura Boulevard, Agouri	T1N, R18W. Not Sectioned.	Thousand Oaks	All types. Daily limit on liquids: 87 tons.	$1.60	300	250 acres	1070 tons/day of rubbish. 87 tons/day of liquid.
Simi Valley	Ventura Regional County Sanitation District	1011 West Los Angeles Ave., Simi Valley	T2N, R18W. Sec. 6.	Simi	All types.	$1.75	230	15 years. life	300 tons/day of rubbish. 4000 gals/day of liquid.

Table 2. Geographical factors.

Map no. and name	1 U.S.G.S. 15' quadrangle	2 Drainage basin area (sq. mi.)	3 Playa area (sq. mi.)	4 Playa elevation (feet above sea)	5 Freeboard in feet	6 Direction of spill	7 History of being flooded
1 Mirage	Shadow Mts.	120	5	2835	55	E. to Mojave River	No
2 Rabbit	Lake Arrow-head	87	2	2936	40	E. to Lucerne Dry Lake	Unknown
3 Reed	Apple Valley	19	0.25	3180	25	S. into Apple Valley	Unknown
4 Lucerne	Lucerne Valley Ord Mts.	376	7	2850	200	To east	Unknown
5 Soggy	Old Woman Springs	40	0.9	2870	10	E. into Melville Dry Lake	Unknown
6 Melville	Old Woman Springs	191	1.5	2700	120	E. into Means Dry Lake	Unknown
7 Means	Old Woman Springs Emerson Lake	46	1	2575	85	E. into Emerson D.L.	Unknown
8 Galway	Lavic	106	1.5	2700	50	S.E. into Emerson D.L.	Unknown
9 Harper	Fremont Pk. Opal Mt.	514	16	2020	155	S.E. into Mojave River	No
10 Cuddeback	Cuddeback Lake	130	6.3	2550	150	S.E. into Harper D.L.	Unknown
11 Coyote	Alvord Mt. Lane Mt.	146	9	1705	65	S.E. into Mojave River	No
12 Troy	Newberry	133	5.3	1775	15	N. to Mojave River	Unknown
13 West of Superior	Opal Mt. Pilot Knob	172	3.2	3005	175	S. into Harper D.L.	Unknown
14 Superior	Opal Mt. Pilot Knob	172	2.6	2995	185	S.E. into Harper D.L.	Unknown
15 E. Cronese	Cave Mt.	154	2	1060	40	E. into Soda D.L.	Yes, from Mojave River
16 W. Cronese	Cave Mt.	154	1.5	1060	10	S.E. into E. Cronese D.L.	Yes, from Mojave River
17 Soda	Soda Lake	590	40.7	925	negligible	N. into Silver D.L.	Yes, from Mojave River
18 Silver	Baker	40	3.2	925	35	N. into Riggs D.L.	Yes, from Soda D.L.
19 Riggs	Baker	99	2.2	740	negligible	N. into Silurian D.L.	Yes, from Silver D.L.
20 Silurian	Silurian Hills	293	2.1	675	negligible	N.W. into Amargosa River	Yes, from Riggs D.L.

Table 3. Geological factors.

Map no. and name	8 Playa surface material	9 Groundwater quality	10 Deleterious ions in groundwater	11 Total dissolved solids (parts per million)	12 Depth to groundwater in feet	13 Use of groundwater	14 Mineral resource potential
1 Mirage	Clay	Marginal to inferior	F, SO_4, Na	As much as 2600	Some artesian flow	Unknown	Unknown
2 Rabbit	Clay	Unknown	Unknown	Unknown	Unknown	None	Unknown
3 Reed	Clay	Unknown	Unknown	Unknown	Unknown	Domestic	None
4 Lucerne	Clay	Good to inferior	Na, Cl	200-5000	Unknown	Unknown	Unknown
5 Soggy	Clay	Unknown	Unknown	Unknown	4-285	Irrigation	None
6 Melville	Clay	Unknown	Unknown	Unknown	Unknown	None	Unknown
7 Means	Clay	Poor	Na, Cl, bicarbonate	1410	Unknown	Unknown	Unknown
8 Galway	Clay	Unknown	Unknown	Unknown	16-21	None	Unknown
9 Harper	Clay salt	Marginal to inferior	B, Na	As much as 2391	Unknown	Irrigation	Unknown
10 Cuddeback	Clay	Marginal to inferior	Cl	375-4734	60	Unknown	None
11 Coyote	Clay	Inferior	F, Na	620-914	0-3	Unknown	Unknown
12 Troy	Clay	Marginal to inferior	F, B, Na	278-3313	0-20	Unknown	Unknown
13 West of Superior	Clay	Marginal to inferior	Na, F	605	106	Unknown	Unknown
14 Superior	Clay	Marginal to inferior	Na, F	605	105	Unknown	Unknown
15 E. Cronese	Clay	Inferior	Na, B, F	1680	12-45	Unknown	Unknown
16 W. Cronese	Clay	Inferior	Na, B, F	1680	12-45	Unknown	Unknown
17 Soda	Clay salt	Marginal to inferior	F	1510	65 or less	Domestic	Evaporite potential
18 Silver	Clay salt	Marginal to inferior	Na, F	1000	Unknown	Unknown	Evaporite potential
19 Riggs	Clay salt	Inferior	Na, F, Cl	1740	Unknown	Unknown	Evaporite potential
20 Silurian	Clay salt	Inferior	Na, Cl	5385-8540	425	Unknown	Evaporite potential

Table 4. Land use and engineering factors.

Map no. and name	15 Distance to Santa Ana (miles)	16 Miles of road needed	17 Distance to rail (airline miles)	18 Development, land use, and visibility	19 Ownership of dry lakes
1 Mirage	102	2	23	Recreational site. Gliders and sky diving.	[illegible] U.S., 70% private
2 Rabbit	104	0	3	No development. Highly visible.	[illegible]% U.S., 10% private
3 Reed	106	0	9	Scattered houses.	100% private
4 Lucerne	115	0	6	Extensive. Houses & crops.	5[illegible]% U.S., 50% private
5 Soggy	122	5	12	None.	100% U.S.
6 Melville	130	8	17	None.	100% U.S.
7 Means	134	12	21	Slight development to S.E.	65% U.S., 35% public water reserve
8 Galway	140	18	23	None.	65% U.S., 30% private, 5% military
9 Harper	141	2	4	Agriculture on S.E. side.	60% U.S., 40% private
10 Cuddeback	149	7.5	18	None.	80% U.S., 20% private
11 Coyote	149	8	7	None.	75% U.S., 25% private
12 Troy	151	0	0	Crossed by highway & rail.	30% U.S., 70% private
13 West of Superior	164	20	21	None.	95% U.S., 5% private
14 Superior	167	20	21	None.	80% U.S., 20% private
15 E. Cronese	173	3	6	None.	60% U.S., 40% private
16 W. Cronese	176	5	8	None.	100% U.S.
17 Soda	189	0	4	Development at Baker.	95% U.S., 5% private
18 Silver	189	0	18	Development at Baker.	90% U.S., 10% private
19 Riggs	191	0	27	None.	Not determined
20 Silurian	200	0	29	None.	Not determined